Chapter 12
Hotspots Analysis: Providing the Focus for Action

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Abstract The technique 'hotspots analysis' belongs to the toolbox life cycle management. 'Hotspotting' or 'hotspots analysis' is an emergent technique being used in a growing number of different analytical disciplines, so research disciplines and functions within organizations (e.g., R&D, new product development, procurement), and in diverse geographies, in support of the green economy and the United Nations post-2015 Sustainable Development Goals. It can be used to inform government policy priorities, drive growth and innovation in business and empower citizens.

Due to the growing interest of various stakeholders in applying hotspot analysis methodologies, the UNEP/SETAC Life Cycle Initiative initiated the project "Global Principles and Practices for Hotspot Analysis". During the first phase of the project, a study was conducted to map existing hotspots analysis methodologies and studies world-wide, which culminated in the report: *Hotspots Analysis: mapping of existing methodologies, tools and guidance and initial recommendations for the development of global guidance*. This chapter draws on knowledge derived from this report and presents a number of relevant findings.

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1 Introduction

The information-age has led to a proliferation of content, ranging from the assimilation and analytical challenges associated with 'big data' through to ever-increasing publication lists of research and innovation findings. The major challenge for businesses, policy-makers, academic researchers and consumers is deciding where and how to act to have the maximum impact. For any action a balance must be struck between speed of response and pragmatism and the need to be informed by reliable and trustworthy science-based evidence.

This prioritization method is called 'hotspotting' or 'hotspots analysis' and is an emergent technique being used in a growing number of different analytical disciplines.

This technique belongs to the toolbox life cycle management (LCM). LCM is the *application* of life cycle approach including LCA and related methods as SLCA and LCSA in business to drive business improvement. Life cycle management essentially embraces many applications of life cycle approaches, including product – as well as company-related approaches – to ensure that the full range of risks and opportunities are known and actions taken to reduce impacts across the value chain.

We believe there is now an opportunity to collate existing techniques from around the world to develop a proven methodology for hotspots analysis. This can be adopted by multiple research disciplines and functions within organizations (e.g., R&D, new product development, procurement) and in diverse geographies, in support of the green economy and the United Nations post-2015 Sustainable Development Goals (SDGs). It can be used to inform government policy priorities, drive growth and innovation in business and empower citizens.

Due to the growing interest of various stakeholders in applying hotspot analysis methodologies, the UNEP/SETAC Life Cycle Initiative decided in 2012 to focus its Flagship Project 3a on the topic under the title of "Global Principles and Practices for Hotspot Analysis". During the first phase of the project, a study was conducted to map existing hotspots analysis methodologies and studies world-wide, which culminated in the report: *Hotspots Analysis: mapping of existing methodologies, tools and guidance and initial recommendations for the development of global guidance*[1] (Barthel et al. 2014).

This chapter draws on knowledge derived from this report and presents a number of relevant findings.

[1]The report can be accessed at: http://lifecycleinitiative.org/wp-content/uploads/2014/10/Flagship3a-Hotspots-Mapping.pdf

2 What Is Hotspots Analysis?

Over the past few years, hotspots analysis has become a helpful and effective tool that assists in the identification of areas to be prioritized for action.

Hotspots analysis (HSA) is defined as a methodological framework that allows for the rapid assimilation and analysis of a range of information sources, including life cycle based studies, market, and scientific research, expert opinion and stakeholder concerns. The outputs from this analysis can then be used to identify potential solutions and prioritize actions around the most significant economic, environmental, ethical and social sustainability impacts or benefits associated with a specific country, city, industry sector, organization, product portfolio, product category or individual product or service. Hotspots analysis is often used as a pre-cursor to developing more detailed or granular sustainability information (Barthel et al. 2014).

The findings from hotspots analysis provide a comprehensive understanding of impacts. They also allow for the prioritization of resources and actions in countries, cities, industry sectors, product portfolios, product categories or individual products that really matter by virtue of their environmental, social and ethical impact profile and/or their physical trading volumes and economic value in the economy. In addition to streamlining research and analysis, a common feature of hotspots analysis is the presentation of information and findings in accessible formats, including for non-technical audiences, who are often the key decision-makers in policy and business settings.

The benefits of hotspots analysis include the following factors (Barthel et al. 2014):

- The rapid assimilation and analysis of multiple evidence threads leading to accessible outputs and a clearer understanding of the actions required to eliminate, reduce or mitigate identified hotspots
- A highly cost-effective approach to life cycle thinking and management across multiple impact categories and issues, sectors or product categories that is perhaps more suited to developing countries, emerging economies and SMEs trying to find an evidence-based focus for their actions
- The provision of both technical and non-technical information to decision-makers in government, business and civil society

2.1 Typical Steps to Conduct Hotspots Analysis

Hotspots analysis employs a materiality-focused prioritization approach to identify sustainability impacts across a range of attributes such as economic, environment, social and governance. The results from hotspots analysis typically allow decision-makers to identify sustainability impact improvement opportunities and prioritize impact reduction actions. Hotspots analysis methodologies often use research and expert inputs and stakeholder views to develop criteria and a mechanism for prioritization and interpretation of the outputs according to the scope and scale of the study.

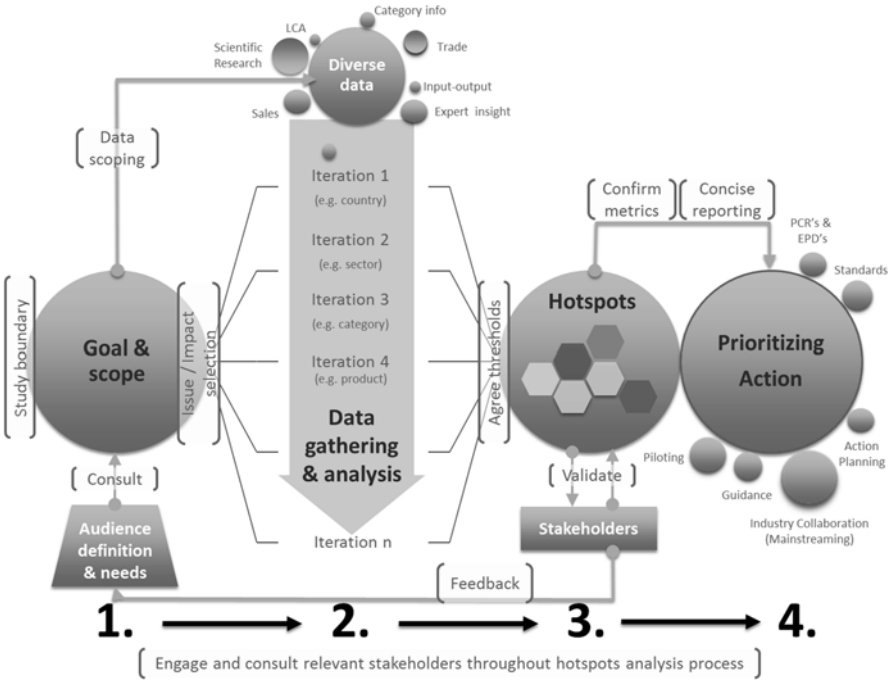

Fig. 12.1 Typical steps in a hotspots analysis methodology (Barthel et al. 2014)

The following steps illustrate what a typical hotspots analysis involves (see also Fig. 12.1).

1. *Goal and Scope definition*: The first step involves defining goal and scope by understanding the requirements of the hotspots analysis study. The next step involves stakeholder mapping and engagement to identify and gain consent on the study boundary, attributes, impact categories, identifying the ground rules of data mining and analysis and the need to use proxy data where this is required. In essence this step would include defining goal; scope and agreement on broad materiality and prioritization approach for the study.
2. *Data gathering, expert insights and analysis*: This step would include knowledge building through data mining, data analysis, data validation, expert interviews and stakeholder consultations. This step typically involves drawing together different evidence threads such as the findings from life cycle studies, input/output analysis data, scientific research studies, product information, sales volumes/economic value and trade information, depending on the scale and scope of the study (e.g. whether the analysis is being done at the national, city, sector or product-category-level).
3. *Hotspots identification and validation*: Once all the required data and knowledge is gathered, it is time to identify, develop, discuss and obtain agreement on materiality thresholds (i.e., when does an impact become a hotspot) and the

criteria to be used for ranking and prioritising hotspots for action, including a stakeholder validation process relating to identified hotspots. The next step includes the identification and prioritization of impact reduction opportunities, reviewing and validation of the identified hotspots by a larger audience and identifying implementation gaps and recommendations required to achieve impact reduction opportunities.

4. *Prioritising action*: The last step involves using the outputs from the study to achieve sustainability improvements. Typically, this step would involve action planning, development of industry guidance and standards, piloting or road-testing of potential solutions, industry collaborations and voluntary agreements, etc.; and further working with relevant stakeholders to disseminate and mainstream proven or effective solutions based on feedback from piloting activities.

2.2 Approaches of Hotspots Analysis

Most hotspots analysis use quantitative, qualitative or a combination of quantitative and qualitative approaches.

Quantitative approach typically uses quantitative data such as traditional life cycle assessment data, product data, sales and trade data, input–output data or material flows analysis or contextual market data for the study. Most hotspots analysis use some form of quantitative approach with stakeholders' involvement in the development process according to the study by (Barthel et al. 2014). Examples of hotspots analysis methodologies that use a quantitative approach include the *GHG Protocol's Value Chain (Scope 3) Accounting and Reporting Standard*[2]; and the *GHG Protocol's Product Life Cycle Accounting and Reporting Standard.*[3]

Qualitative approach typically involves securing access to extensive expert knowledge and professional judgment, gaining a better understanding of stakeholder's concerns and deeper stakeholder engagement as required. This approach has more emphases on qualitative elements. The Sustainability Accounting Standards Board (SASB) Materiality Map[4] is an example of hotspots analysis that uses a qualitative approach.

Combination approach would use both quantitative and qualitative measures to identify the hotspots. Such studies use quantitative data, expert opinions and stakeholder engagement to conduct hotspots analysis. Many of the existing hotspots analysis methodologies use a combination approach to identify sustainability impacts and improvement action as observed in a recent study (Barthel et al. 2014).

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[2] A copy of the *GHG Protocol's Value Chain (Scope 3) Accounting and Reporting Standard* may be accessed at: http://www.ghgprotocol.org/standards/scope-3-standard

[3] A copy of the *GHG Protocol's Product Life Cycle Accounting and Reporting Standard* may be accessed at: http://www.ghgprotocol.org/standards/product-standard

[4] The Sustainability Accounting Standards Board (SASB) Materiality Map may be accessed at: http://www.sasb.org/materiality/sasb-materiality-map/

Examples of such approach include The Sustainability Consortium (TSC),[5] Public Gardens Sustainability Index[6] hotspots analysis and AHAM hotspots analysis[7] and WRAP's Product Sustainability Forum (PSF)[8] in the UK (WRAP: Waste & Resources Action Programme).

3 Applications/Use of Hotspots Analysis

The purpose of hotspots analysis is to help policy-makers, businesses and other stakeholders to collate, analyze and visualize sustainability hotspots information and insight drawn from a range of different data and information sources in order to move more swiftly from research and analysis towards tangible, practical actions (Barthel et al. 2014).

Typical application of hotspots analysis include:

- Product- and sector-level sustainability standards
- Government or trade association sponsored voluntary agreements with industry
- Policy, research and innovation activities to drive more sustainable forms of production and consumption
- Strategic prioritization of areas for impact management in global value chains
- Information to support consumer-facing campaigns or business-to-business communications and messages on key sustainability themes
- Pilots, value chain and stakeholder collaborations and partnerships to address key sustainability hotspots

A range of different stakeholders, such as industry, government, trade associations and collaborative groups, are using hotspots analysis methodologies to identify sustainability improvement opportunities and develop action plans to address identified hotspots. Table 12.1 shows some of the existing hotspots analysis methodologies developed by different stakeholders.

[5] More information on The Sustainability Consortium may be accessed at: http://www.sustainabilityconsortium.org/

[6] A copy of the Public Gardens Sustainability Index may be accessed at: http://www.publicgardens.org/files/files/Longwood%20Gardens%20-%20Sustainability%20Index%20for%20North%20American%20Public%20Gardens%20v%201_0%20-%20Final%2020130514.pdf

[7] More details on the Association of Home Appliance Manufacturers (AHAM) hotspots analysis used in the development of the *AHAM 7001-2014/CSA SPE-7001-14/UL 7001, Sustainability Standard for Household Refrigeration Appliances* may be found at: http://lcacenter.org/lcaxii/final-presentations/513.pdf

[8] More information on the Waste Resources Action Programme's (WRAP) Product sustainability Forum (PSF) may be accessed at: http://www.wrap.org.uk/content/product-sustainability-forum-psf

Table 12.1 Examples of different stakeholders using hotspots analysis

Led by	Examples
Industry	Textiles and clothing (WRAP, UK)
	Home improvement products (WRAP, UK)
	Detergents
	Electrical and electronic products (The Sustainability Consortium, USA)
	Drinking water filtration systems (WQA, North America)
	Home appliances (AHAM, North America)
Government	Grenelle I and II Laws (France)
	EU Product/Organizational Environmental Footprint
Collaborative groups	The Sustainability Consortium (USA)
	Product Sustainability Forum (WRAP, UK)
	Product Category Rules (PCR) Guidance
	Water Footprint Network (Netherlands)
	Ellen MacArthur Foundation (UK)
UNEP 10 year framework of programmes on SCP	Consumer Information Programme
	Sustainable Lifestyles and Education Programme
	Sustainable Tourism, including Ecotourism Programme
	Sustainable Food Systems Programme

3.1 Scale of Application

Hotspots analysis methodologies are flexible and can be adapted based on the scope and scale of application required by those commissioning or undertaking studies. In general hotspots analysis can be applied at:

National and city: Countries and cities use hotspots analysis to help government policy-makers to focus on voluntary agreements or action plans with industry, citizens and communities in areas where sustainability hotspots have been identified. Examples include: the Water Footprint Network's analysis of water scarcity hotspots in major river catchments, World Resources Institute's work to quantify cities carbon emissions, etc.

Sector/industry and product category/product: Businesses use hotspots analysis to identify improvement opportunities and action plans, particularly in areas such as future resource availability and management, global supply chain risks and volatility, waste prevention and management, etc. Examples of sector initiatives based on hotspots analysis include: the UK grocery retailer – Tesco, tackling the food losses and food waste associated with the international sourcing of its products and their use by consumers; and The Sustainability Consortium building consensus around the key sustainability hotspots to be addressed in consumer goods value chains.

3.2 Attributes

Hotspots analysis studies tend to cover a wide range of attributes depending on the scope and scale of application. Broadly hotspots analysis can cover single or multiple attributes.

Single attributes would cover only one attribute, such as environmental or economic or social sustainability or the governance issues and challenges associated with the use of natural resources (e.g., water, biodiversity). Most of the existing single attribute hotspots analysis studies cover environmental issues, with some focusing on single impact categories, like carbon management or greenhouse gas (GHG) emissions. Examples of such studies include: *GHG Protocol's Product Life Cycle Accounting and Reporting Standard*, Japan Environmental Management Association for Industry (JEMAI)'s Carbon Footprint Program[9] and the Water Footprint Assessment Methodology.[10]

Multiple attribute studies would cover more than one attribute such as environmental-social or economic-environmental-social or economic-environmental-social-governance, etc. Many of the existing hotpots analysis cover multiple attributes. Examples of multiple attributes hotspots analysis study include: SASB Materiality Map, The Sustainability Consortium (TSC), WRAP's Product Sustainability Forum (PSF), AHAM hotspots analysis, etc.

3.3 Commonalities and Differences Among Methodologies

The UNEP/SETAC Life Cycle Initiative Flagship Project 3a report documents some general commonalities and differences among the 21 hotspots analysis methodologies analyzed during the project's initial phase (Barthel et al. 2014). The findings are summarized below:

Commonalities

- All of the key methodologies engage several stakeholders in their development.
- All (with the exception of two) methodologies include environmental impacts.
- All methodologies, at a minimum, utilize a quantitative life cycle approach. Some exclusively, others also incorporate qualitative elements.
- The majority of approaches address multiple impacts.

Differences

- National-level methodologies all exclusively utilize a quantitative approach which addresses environmental impacts, while sectoral- and product-level

[9] More information on Japan Environmental Management Association for Industry (JEMAI)'s Carbon Footprint Program, may be accessed at: http://www.cfp-japan.jp/english/

[10] More information on the Water Footprint Assessment Methodology may be accessed at: http://www.waterfootprint.org/downloads/TheWaterFootprintAssessmentManual.pdf

methodologies tend to be more diverse in the impacts and issues they address, as well as in the use of more qualitative elements and inputs.
- National-level methods tend to focus on the use of input/output analysis or materials flows analysis; whereas sector- or product-level methodologies tend to focus on life cycle approaches or "beyond LCA[11]" approaches.
- While the hybrid funding (i.e., a combination of both public and private funding) appears to be dominant among the methodologies, there is no common model that can be attributed to any of the three methodology levels.

3.4 Case Studies

In order to provide some perspective on all of the attributes of hotspots analysis (HSA) covered so far in this chapter, a few HSA case studies have been selected to illustrate and elaborate the different types of hotspots analysis methodologies being used. In the examples given below, we will provide a brief description of the HSA methodology that was/is being applied and the salient features of the methodology. Table 12.2 (see Sect. 3.4.4) provides additional information on various aspects of HSA from development and application to stakeholder engagement. These example hotspots analysis methodologies were chosen to help visualize the range and variability/diversity in scope and scale of hotspots analysis from approach to application. It is not the authors' intention to convey that these HSA methodologies are superior or preferred to any other HSA methodologies available.

3.4.1 Association of Home Appliances Manufacturers (AHAM)

AHAM utilizes hotspots analysis as the main tool to identify and prioritize life cycle sustainability impacts that would be addressed in its resultant product sustainability standards. Since 2010, AHAM has been utilizing hotspots analysis on several products including: refrigeration appliances, clothes washers, cooking ranges, dishwashers, as well as a range of portable and floor care appliances.

AHAM's hotspots analysis methodology seeks to identify the most significant environmental, social and governance impacts across the life cycles of these products. This process is overseen by a task force comprising: AHAM, its standards development partners (UL Environment and the CSA Group), a range of appliance manufacturers, experts with significant product or relevant industry experience, as well as its sustainability consultant – PE INTERNATIONAL (now re-branded as thinkstep).

[11] In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via life cycle assessment (as encompassed by environmental life cycle assessment, social life cycle assessment and life cycle costing). "Beyond LCA" should not be interpreted as better than or superior to life cycle assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

Table 12.2 Summary of hotspots analysis methodologies and application (Barthel et al. 2014)

Methodology	Approach	Breadth of impacts	Stakeholder involvement	Target audience	Application
AHAM Hotspots Analysis	Qualitative and quantitative (Combination)	Environmental, Social, Governance	Stakeholder review of methodology and pilot testing of standards	AHAM's sustainability standards Task Force members as well as key value chain stakeholders	Home appliance product sector
WRAP's Product Sustainability Forum	Qualitative and quantitative (Combination)	Environmental, Economic	Multiple stakeholders involved	Major retailing and manufacturing businesses, NGOs, academics and governments	Food, DIY (home improvement) products, electrical and electronic products, clothing and textiles, retail sectors
Sustainability Accounting Standards Board (SASB) Materiality Map	Qualitative	Environmental, Social, Economic and Governance	Corporations, market participants, and public interest and intermediaries	SASB standard development working groups and other relevant stakeholders	Several sectors such as Architecture & Engineering Consumption Energy Financial Food & Beverage Forestry and Paper Health Care Home & Office Non-renewable Resources Personal Care Products etc.
Global Protocol for Community-scale GHG emissions	Quantitative	Environmental	Multiple stakeholders	Anyone assessing the GHG emissions of a geographically defined area	Transportation, Waste, Industrial Processes, Agriculture, Forestry and Other Land Use sector

Prior to commencing the hotspots analysis, the task force creates a template value chain heat map to identify sustainability attributes for the resultant Standard. This involves the review and condensation of the typical life cycle assessment (LCA) impact categories into a more simplified format that would facilitate harmonizing, categorizing, and analysing environmental/sustainability issues (i.e., hotspots) with broader stakeholder pressures (i.e., hot buttons).

The first step of the hotspots analysis involves a review of available literature to identify significant product life cycle impacts. This review includes: life cycle assessment studies on the candidate product or product components, manufacturer product life cycle data, academic studies, environmental product declarations (EPDs) and existing standards.

Another key contribution to the hotspots analysis involves interviews with selected manufacturers. Each manufacturer is asked to rank the level of importance (i.e., high, medium, or low) of addressing each of environmental impacts across the five life-cycle stages of the product category. The results of the literature review, stakeholder interviews, as well as review of other existing standards were aggregated into a heat map to graphically provide a preliminary view into priority environmental impacts and stakeholder concerns.

Throughout the process, an extensive stakeholder engagement is conducted to review the results of the hotspots analysis and solicit feedback. In these engagements, AHAM typically include representatives from the following sectors: manufacturers, suppliers, retailers, government agencies, consumer groups, and non-governmental organizations.

As an additional level of rigor, prior to translating these hotspots into criteria within its sustainability standards, AHAM often conducts a screening-level life cycle assessment using primary (where available) and proxy data from manufacturers and industrial databases to verify and validate the result of the hotspots analysis.

Pilot-testing of the resultant sustainability standards by appliance manufacturers is also a core component of the overall process.

3.4.2 Global Protocol for Community Scaled Greenhouse Gases Emission Inventories (GPC)

GPC (global protocol for community scaled greenhouse gases emission inventories) conducted hotspots analysis to identify requirements and provide guidance for calculating and reporting city-scale GHG[12] inventories, consistent with the 2006 IPCC[13] Guidelines for National GHG Inventories. The goal is to allow for more credible reporting, meaningful benchmarking and aggregation of climate data and greater consistency in GHG accounting. The Global Protocol for Community-Scale GHG Emissions (GPC) is the result of a collaborative effort between the World Resources Institute (WRI), C40 Cities Climate Leadership Group (C40), and ICLEI – Local Governments for Sustainability (ICLEI).

[12] GHG: greenhouse gases.

[13] IPCC: Intergovernmental Panel on Climate Change.

The GPC specifies the principles and rules for compiling a city-level GHG emissions inventory; it does not require specific methodologies to be used to produce emissions data. It provides guidance on calculation methodologies (i.e., defining boundaries, defining emission sources, calculation guidance) for individual emission sources including stationary energy, transportation, waste, industrial processes and product use emissions and agriculture, forestry and other land use.

3.4.3 WRAP's Product Sustainability Forum (PSF)

WRAP's PSF (Product Sustainability Forum) was established in late 2010 in response to a request from the UK governments and major retailers and manufacturing companies to establish a pre-competitive space for collaboration between governments, business, NGOs, academia and other key stakeholders to come together to build the evidence to help quantify, reduce and communicate the whole lifecycle environmental impacts and hotspots associated with consumer products in the UK economy. Since its creation in 2010, WRAP's PSF and the organizations that support it have been working together to achieve these objectives. Following almost 3 years of research WRAP's PSF is now beginning to apply its work in a growing number of international supply chains through Pathfinder demonstration projects; mainstreaming projects that seek to embed lifecycle and sustainability thinking at the heart of organizations; and the growing membership and geographical coverage of the International Network of Product Sustainability Initiatives[14] (INPSI), which WRAP's PSF was instrumental in establishing in 2012.

WRAP's PSF uses a similar methodology to identify hotspots as identified in Sect. 2; more information on the specific methodology and application, including links to its free, on-line knowledge base is available.[15] In the last year, WRAP's PSF has moved away from a primary focus on hotspots-related research to more of an action-orientated approach, focusing more of its resources on driving change within its supporting organizations through Pathfinder demonstration projects and mainstreaming and embedding activities. Feedback from all of these collaborative activities is now being used to improve and update the data and information gathered during the initial hotspots analysis phases based on production-specific and value chain performance information.

3.4.4 Other Attributes

Table 14.1 provides further information on different attributes of HSA methodologies discussed in this chapter such as approach, breadth of impacts covered, stakeholders' involvement, target audience and application for selected existing methodologies.

[14] More information on the International Network of Product Sustainability Initiatives (INPSI): http://www.product-sustainability.net/

[15] http://www.wrap.org.uk/content/psf-knowledge-base-0

The purpose of Table 12.2 is to allow visualization of the flexibility and diversity of HSA methodologies development and application.

4 Other Tools Used to Identify Sustainability Impacts

A growing number and diversity of tools, resources and methodologies are being developed and used to identify sustainability impacts. This often leads to confusion among stakeholders with regards to the best tools for the job and the best way to use them to generate science-based and actionable outputs and information. Sometimes this confusion – and the range of tools and methodologies available to users – leads to erroneous conclusions, such as HSA being superior to, or replacing life cycle assessment studies (LCA). This section would discuss the roles of HSA and other methodologies as tools to identify and take action on sustainability impacts.

Life cycle thinking and a value chain perspective is imperative to achieve robust sustainability assessment results. ISO 14040 (2006) is the *de facto* globally accepted standard for conducting life cycle assessments (LCA) to identify the environmental impacts of the product or system being analyzed. The precepts and process steps contained in ISO 14040 have also been adapted to inform the development of other life cycle-based approaches and analytical tools, including those that focus on economic impacts (i.e., life cycle or whole life costing) and social impacts (i.e., social life cycle assessment). These latter applications are not as well developed, nor are they used as widely as traditional environmental LCA.

The ISO 14040 series provides a technically rigorous framework for conducting life cycle assessments (LCA), which is widely used for measuring the environmental dimensions of sustainability. Life cycle costing (LCC) and social life cycle assessments (S-LCA) also use the ISO 14040 framework with some adaptations. The UNEP/SETAC Life Cycle Initiative's publication "Towards a Life Cycle Sustainability Assessment, 2011" elaborates the use of ISO 14040 framework to conduct environmental LCA and further adapted to conduct LCC and S-LCA studies in detail (UNEP/SETAC Life Cycle Initiative 2011).

4.1 Hotspots Analysis Versus Other Tools

Environmental LCA, S-LCA and LCC each quantify specific impacts related to their respective attributes of sustainability as shown in Fig. 12.2. Hotspots analysis is more flexible and can incorporate several attributes of sustainability, such as economic, environment, social, ethical and governance, depending on the scope and scale of application, as shown in Table 12.1. Figure 12.2 shows the scope and impacts covered by LCA, LCC, S-LCA and hotspots analysis respectively.

Hotspots analysis offers a complementary approach to more traditional life cycle-based methods; it is not a replacement or competitor to LCA, LCC and

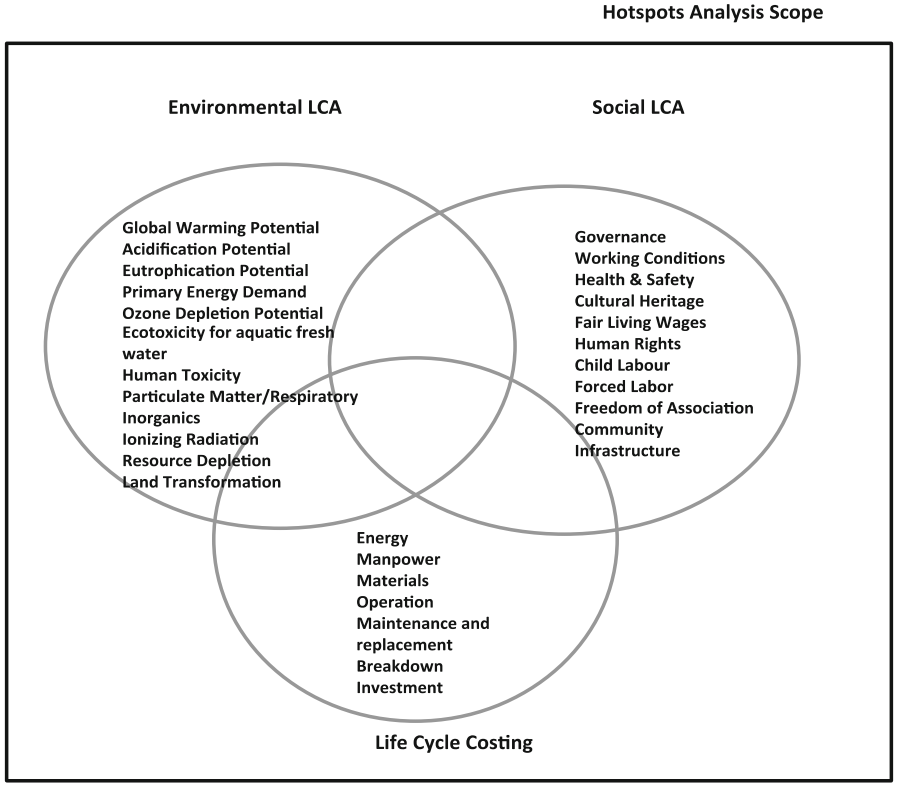

Fig. 12.2 Scope of representative impacts covered by LCA, LCC, S-LCA and hotspots analysis methodologies

Table 12.3 Comparison of hotspots analysis with LCA, LCC and S-LCA

Methodology	Stakeholder engagement	Potential impact coverage	Ease of use	Approach	
				Qual.	Quant.
Hotspots analysis	■■■	O$✠◆	++	✓	✓
Life cycle assessment (i.e., ISO 14040)	■■	O	+		✓
Social life cycle assessment (Adapted from ISO 14040 series)	■■	✠	+	✓	✓
Life cycle costing studies	■	$	+		✓

■■■Full engagement and pilot testing; ■■Moderate engagement throughout the process; ■Limited phases of engagement; $Economic; O Environment; ◆Governance; ✠ Social; +++ Easy; ++ Moderate; + Difficult

S-LCA. In fact, in most cases hotspots analysis can be the initial step to identify and prioritize sustainability impacts at pre-competitive/pre cursor level, support decision-making and also obtain stakeholder engagement and validation. In some cases, where available, existing LCAs (both data and information) are used as input into the hotspots analyses. The second step could be to conduct LCA, S-LCA, LCC (depending on the scope) to quantify impacts and further support decision-making, comparison and improvement at greater accuracy based on primary/secondary data and models. HSA allows initial scoping, identification and prioritization, while LCA, LCC and S-LCA may be used to engage in a more in-depth analysis and perhaps to validate the outcomes of HSA.

Table 12.3 compares hotspots analysis with ISO 14040 series based-environmental LCA, S-LCA and LCC across various indicators such as: level of stakeholder engagement, types of sustainability impacts covered, ease of use and type of approach (i.e., qualitative vs. quantitative).

5 Key Observations

Within the UNEP/SETAC Flagship Project 3a report (Barthel et al. 2014) some general observations were made with regard to the hotspots analysis methodologies analyzed therein. Several of these observations are discussed below.

5.1 Audience and Application

Existing hotspots analysis methodologies are being developed with a number of audiences and sustainability-based applications in mind. Some studies are being used to help government policy-makers to focus voluntary agreements or action plans with industry in areas where sustainability hotspots have been identified. For

example, as is the case with WRAP's Product Sustainability Forum's work in the UK food chain, the French Government's work to provide more sustainability information to consumers, or the Water Footprint Network's analysis of water scarcity hotspots in major river catchments.

Businesses are using hotspots analysis to focus their resources, drawing up action plans and practical programs of work to eliminate, reduce or mitigate hotspots in their global value chains; and tackling major societal and commercial issues like food waste, food and resource security (future supply risk and resilience issues); and water use in agriculture. For example, the work of UK grocery retailer, Tesco, to tackle the food losses and food waste associated with the international sourcing of its products and their use by consumers; and the work of The Sustainability Consortium in building consensus around the key sustainability hotspots to address in consumer goods value chains. Other stakeholders are using the findings from hotspots analysis to inform their thinking. For example, the Oxford Martin School at Oxford University is working alongside WRAP in the UK to use hotspots analysis to inform its thinking on the research, policy and business drivers to facilitate a mass movement over time to healthier, more sustainable eating patterns or diets.

5.2 Beyond LCA

In some cases, the scope of hotspots analysis methodologies and studies are broadening beyond consideration of one or more environmental impact categories and including "beyond LCA" approaches and wider sustainability topics like biodiversity management, animal welfare, fair trading arrangements, land use and land use change and governance issues around raw materials or water resources.[16] This development would suggest that both methodology developers and users see the value in securing a more holistic view of hotspots, allowing them to identify where trade-offs may need to be considered (e.g., between traditional intensive agricultural practices and the potential impact on the agri-ecosystems that support them). The importance of taking a "beyond LCA" approach to the development of hotspots analysis methodology was also highlighted by stakeholders as important.

While there is still a clearly defined niche for traditional LCA approaches that solely utilize quantitative data and exclusively address environmental impacts, there are a growing number of hotspots analysis methodologies that move beyond traditional LCA and include either additional quantified data and information (e.g., trade, market and sales data; contextual sector or product category information; sup-

[16] In the use of the term "beyond LCA" the authors mean that hotspots analysis, as a complementary tool, is able to expand upon the scope and range of impacts that may be identified via life cycle assessment (as encompassed by environmental life cycle assessment, social life cycle assessment and life cycle costing). "Beyond LCA" should not be interpreted as better than or superior to life cycle assessment. LCA and hotspots analysis are in fact complementary tools with their own strengths and limitations.

porting scientific research and innovation; materiality studies); and/or qualitative inputs, such as expert opinions, stakeholder concerns, consumer attitudinal and behavioral insights, etc. This trend appears to be most prominent among product- and sector-level hotspots analysis methodologies.

This observation does not preclude the fact that the majority of methodologies share a common foundation in that they utilize a life cycle approach to hotspots analysis. Most of the methodologies reviewed by the authors also follow a pragmatic approach that includes the identification of all life cycle aspects and impacts within a study boundary before applying materiality criteria or significance thresholds in order to define which ones are "hot". In some circumstances (not necessarily for the key methodologies identified) a methodology may not consider the whole life cycle at the start, since there may be sufficient existing studies for the same sector or product category suggesting that the hotspots always lie in one or more specific life cycle stages.

The initiation of methodology development stems from a variety of different organisations, and is often linked to a specific objective. Governments may act in relation to policy objectives or priorities, whereas the private sector may act based on a recognition of a business case for action. NGOs may be informed by recognition that a methodology can help in articulating the need for action in line with their objectives.

5.3 Commonalities

Common features of all the methodologies identified by the authors are their engagement with a wide stakeholder base in development and their quantitative nature, though some methodologies also incorporate qualitative information drawn from a range of sources. The majority are focused on multiple impacts and issues, with most covering a core set of environmental issues, though issue-specific methods also exist. The national-level methodologies reviewed exclusively utilize a quantitative approach which addresses environmental impacts, while sectoral- and product-level methodologies tend to be more diverse in the impacts and issues they address, as well as utilising qualitative elements.

While the hybrid funding of methodology development and application appears to be dominant among the methodologies, there is no common model applied at a national, sector, or product level.

5.4 Ease of Use

Another interesting observation that was alluded to in the analysis was that none of the hotspots analysis methodologies listed was "easy" to use. More than half were considered to be "difficult" requiring some expert knowledge or experience; and the

remainder were considered as “moderate” and may require some expert guidance in order to use. As a tool that is used to facilitate decision-making as a precursor to (or in lieu of) a more detailed analysis, hotspots analysis still seems to require at least some expert input.

5.5 Gaps

In terms of gaps, few methods appear to incorporate financial data, in particular on the costs and benefits of addressing hotspots. The methods are generally linked to quantification activity. Links to identification of a range of associated opportunities or solutions to reduce the impact of hotspots identified are often sparse, with notable exceptions in the methodologies developed by The Sustainability Consortium and WRAP’s Product Sustainability Forum. Whilst the need for action is recognized in principle, its incorporation into methods is generally limited. In particular, there is a lack of guidance on how to assess the potential for reducing a hotspot.

6 Challenges and Next Steps

Currently there is no common global approach to hotspots analysis; nor has there been any effort to bring together or share best practice amongst those organizations or initiatives currently developing and using these methods. There is also no accepted guidance on how to translate and apply the results of hotspots analysis into meaningful sustainability information and insight for use by industry, governments and other stakeholders.

Recognizing that this situation may result in a range of negative impacts, including a lack of consistency in the methodological approach, difficulties in comparing the results of hotspots studies and the potential for conflicting sustainability information in the marketplace; the UNEP/SETAC Life Cycle Initiative established Flagship Project 3a to address these and other issues as noted in the introduction to this chapter.

The primary focus of this project is to identify existing methodologies, tools and resources that can or could be applied at three scales or levels of detail, namely at the national, sector or product category-level. A secondary research objective is to seek to determine the potential use, adoption or adaptation of these methodologies by developing countries, emerging economies, SMEs or for use at the city-scale. During the first phase of the project, the UNEP/SETAC Life Cycle Initiative conducted a study to map existing hotspots analysis methodologies and studies world-wide (Barthel et al. 2014).

Phase 2 of this flagship project is seeking to respond to the urgent timeframes and requirements of a number of implementation programs within the UNEP’s 10 Year Framework of Programmes on SCP (10YFP), and the 10YFP Secretariat’s

need to provide national-level hotspots analysis guidance to National Focal Points to help them prioritize their SCP policies and programs.

The second phase will involve a series of rapid-prototyping workshops in one designated geographical location, supplemented with regional webinars to solicit input and feedback from key experts and stakeholders from around the world that were identified during Phase 1 of the project. These workshops and webinars are intended to meet the ultimate objectives of this project, to facilitate the rapid development and refinement of:

1. A common methodological framework and global principles and guidance for hotspots analysis that is capable of being used at different scales or levels of detail (national, sector, product category and city)
2. Best practice guidance for the appropriate use and communication of sustainability information derived from hotspots analysis and other life cycle approaches

These workshops will also be used to test with stakeholders the feasibility of a number of options to bring together the findings, data and information from existing hotspots analysis studies to provide a richer, more global picture of the sustainability hotspots in society and the economy.

With its Flagship 3a, the UNEP/SETAC Life Cycle Initiative continues to address these issues on its way towards developing "Global principles and guidance for hotspots analysis" in the second Phase of the project.

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